

90 - WATT CW TRANSMITTER

MODEL

720



ELECTRONIC INSTRUMENT CO. INC.  
3300 NORTHERN BLVD., L. I. CITY 1, N. Y.



## circuit description

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**OSCILLATOR:** A high transconductance 6CL6 pentode is employed as an electron-coupled Colpitts crystal oscillator. This circuit is noted for its high harmonic output and low crystal heating. Since the oscillatory part of the circuit is isolated from the load side by the screen grid, frequency shift due to plate loading is minimized.

The plate tank circuit consists of a broadly tuned slug coil. It resonates at 40 meters for all bands of operation. The coil acts as a RF choke for 80 meter operation. 80 meter crystals are used for 80 and 40 meter and 40 meter crystals are used for 20, 15, and 10 meters. An external VFO jack is provided which is connected to the grid of the 6CL6 and is selected by a slide switch.

**BUFFER MULTIPLIER:** A 6AQ5 tube is used as a class A buffer on 80 and 40 meters and a class C multiplier on all other bands. Second, third and fourth harmonics are obtained for operation on the 20, 15 and 10 meter bands. A pi-network is employed in the plate circuit to provide a stable load for the final amplifier. Harmonics of the fundamental operating frequency are greatly attenuated by this type of circuit. The screen voltage of the 6AQ5 is variable by a wire-wound potentiometer to provide drive control of the final stage. By this means, efficient and stable operation of the buffer and final is obtained.

**FINAL AMPLIFIER:** A 6146 high perveance power pentode is used as a straight-through class C power amplifier. The grid circuit is driven by the pi-network of the buffer stage. This type of coupling helps to prevent parasites and self-oscillation in the final and also attenuates any high order harmonics that may be present in the grid circuit. The 68 mmf capacitor connected between grid and cathode provides stability for the 6146.

A variable pitch, band-switching, pi-network tank circuit is used to match the final amplifier to various loads between 50 and 1000 ohms approximately. This type of circuit is highly efficient and provides additional harmonic attenuation. A variable 900 mmf capacitor is connected across the output of the pi-network for controlling the degree of loading of the antenna or other load. This tank tunes the 80, 40, 20, 15 and 10 meter bands only.

A 6AQ5 clamper tube is employed to prevent excessive plate current flow if grid drive of the final should fail. It operates by dropping the 6146 screen grid voltage to a low value in the event of such failure.

This tube also is part of the keying circuit and acts as a type of oscillator screen grid regulator when the transmitter is keyed. The transmitter is basically keyed in the oscillator and final cathode circuits, which results in a clean crisp note. Furthermore, there is only about 12 volts across the key terminals at all times since the full B minus potential that is present when cathode circuits are keyed is kept away from the keying terminals. The 6AQ5, in addition to its clamping function, performs this task and thus prevents sparking at the key and also key clicks which result from heavy sparking.

**POWER SUPPLY AND CONTROL:** The power supply is a full-wave, choke input type providing 600 volts with a high efficiency GZ - 34 indirectly heated rectifier. A swinging choke is used in conjunction with two 40 mf electrolytic capacitors connected in series to provide good regulation under CW conditions. The power for the final plate and screen supply is connected to two terminals on an octal plug so that plate modulation can be applied simply by connecting a suitable modulation source to the terminals. A jumper is normally used for CW operation. 6.3 volts ac is also at the same socket for any accessory. There is 117 volts provided at the octal socket for the antenna change-over relay which is energized only in the XMIT position of the FUNCTION switch.

The four-position ceramic wafer FUNCTION switch is used to control the ac line input, center tap grounding of high voltage winding of the power supply, STANDBY and TRANSMIT pilot lamps, and the screen circuit of the 6146. In the TUNE position, the screen of the 6146 is grounded in order to prevent excessive plate current flow when the grid circuit is being tuned. A full pi line filter is employed at the input of the transmitter to attenuate any harmonics that are present on the AC leads. There is a three position METER switch that switches the meter to the grid of the final or the plate. The center OFF position shorts the meter out.

## functions of controls

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**FUNCTION Switch:** Four-position switch providing an OFF position and three mode of operation positions.

OFF — Disconnected from ac line.

STANDBY — Filaments energized B+ supply disabled.

STANDBY pilot lit.

TUNE — Filaments energized and B+ supply enabled and applied generally, but withheld from screen of 6146 final amplifier which is grounded to limit plate current to a very low level.

**TRANSMIT** — Filaments energized, B+ supply enabled and applied to all appropriate points including the 6146 final amplifier screen through its associated dropping resistor. 117VAC line power applied to external relay terminals via pins 2 & 7 of the MODULATOR/EXT. POWER octal socket on the rear chassis apron. TRANSMIT pilot lit.

**METER Switch:** Three-position switch providing three positions of meter insertion.

**GRID** — Inserted in grid circuit of 6146 final amplifier.

**OFF** — Meter shorted.

**PLATE** — Inserted in cathode circuit of 6146 final amplifier.

**GRID DRIVE Control:** Wire-wound potentiometer that varies screen grid voltage of the 6AQ5 buffer-multiplier in order to control the grid current of the final stage.

**ANTENNA LOADING Control:** Variable capacitor in the output pi-network that permits matching of the final amplifier to various antenna load impedances between approximately 50 and 1000 ohms. Functions on all bands.

**BAND SELECTOR Switch:** Three-section ceramic wafer switch permitting choice of the desired band of operation from 80 to 10 meter. Selects one of five coils in the buffer-multiplier circuit and proper taps and coils in the plate tank circuit of the final amplifier.

**PLATE TUNING Control:** Variable capacitor in the output pi-network that tunes the final amplifier to resonance.

**GRID TUNING Control:** Variable capacitor that tunes the buffer-multiplier plate tank circuit to resonance at the desired fundamental or harmonic (second, third, or fourth) frequency.

**VFO-XTAL Switch:** Slide switch on rear chassis apron that permits choice of either crystal (inserted in front panel crystal socket) or VFO (external) operation of the 6CL6 oscillator stage.

**EXT. VFO input:** RCA phono-type receptacle on rear chassis apron for connection of external VFO providing about 10-20 volts RF.

**MODULATOR/ACCESSORY Socket:** Octal socket on rear chassis apron which may serve a number of purposes. a) modulator input, b) operation of antenna relay, c) power take-off for any VFO not having a power supply, d) emergency power input.

## operating instructions

1. From the ground binding post on the rear chassis apron, connect a heavy copper strap to earth ground. A good earth ground connection can be a cold water pipe or an eight to ten foot metal stake driven into the ground.

2. Connect the antenna feed line co-axial cable to the RF output co-axial receptacle on the rear chassis apron. An Amphenol 83-1SP type or equivalent male connector is required for this connection. If a single wire or twin lead is employed, attach a banana plug to the end of the single wire or one conductor of the twin lead and insert it in the center hole of the receptacle. (The remaining conductor of the twin lead should be connected to the adjacent ground binding post.) In areas where interference with TV reception is a difficulty, it is recommended that a low-pass filter and possibly an antenna coupler be inserted between the RF transmitter and the antenna feed line. A short length of co-axial cable should be used to connect the transmitter RF output to the input end of the filter and the antenna feed line co-ax should be connected to the output of the filter. A balanced type of feed line (300Ω, 600Ω, etc.) requires an antenna coupler or balun matching device for proper connection to the transmitter or low-pass filter. (See Fig. 1.) For satisfactory use of a low-pass filter, a low SWR is necessary.

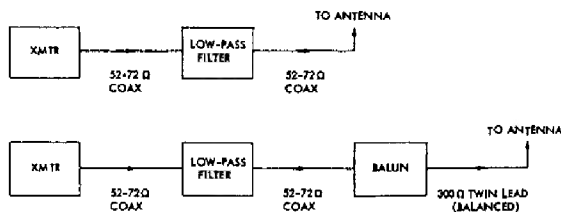


Fig. 1

3. Set controls as follows: **FUNCTION** switch to **STANDBY**, **BAND SELECTOR** switch to desired band from 80-10 meters, **DRIVE** control to 50, **ANTENNA LOADING** control to 0, **PLATE TUNING** control to 30, **GRID TUNING** to 30, **METER** switch to **GRID**. Set **VFO-XTAL** switch on rear apron to desired operation. If VFO is used, connect output of VFO to VFO input receptacle on rear apron; if crystal operation is desired, insert proper crystal into **CRYSTAL** receptacle on front panel. The frequency range of crystals for each band on the possible VFO frequency settings are given in the following chart:

Band	Crystal or VFO (KC)
80	3500-4000
40	7000-7300
20	7000-7175
15	7000-7150
11	6740-6807
10	7000-7425

For CW operation, 80 meter crystals can be used for the 40, 20, and 15 meter bands for improved keying characteristics providing that the **GRID TUNING** control is set within the range given in the chart. This will eliminate the possibility of tuning to the wrong harmonic.

4. Insert the phone plug from the telegraph key into the **KEY** jack on the front panel. Set the **FUNCTION** switch at **TUNE**. Then close the key terminals and adjust the **GRID TUNING** control for maximum grid current, not to exceed 3 ma. Use the **DRIVE** control to limit the grid current peaked by the **GRID TUNING** control to 3 ma maximum. The following chart gives typical settings of the **GRID TUNING** control for each band\*.

BAND	GRID TUNING control setting
80	10-40
40	20-40
20	20-40
15	30-50 (not 70-90)*
10	20-50 (not 70-90)*

\*NOTE: On the 15 and 10 meter bands, two peaks will occur if an 80 meter crystal (or VFO) is used. The larger of the two peaks is the correct one and will occur within the range of settings indicated in the chart. When in doubt use a grid-dip meter or an absorption wavemeter.

5. Set the METER switch to PLATE and the FUNCTION switch to TRANSMIT. Then close the key terminals and adjust the PLATE TUNING control for a minimum current reading (dip). The dip should occur within the following range of settings for each band of operation.

BAND	PLATE TUNING control settings
80	30-70
40	40-70
20	15-30 (not 0-10)*
15	15-30
10	15-30

\*When using 80 meter crystal or VFO.

NOTE: Obtain the dip as quickly as possible as the 6146 final amplifier will draw very high plate current when the plate tank is off resonance. The high current, if prolonged, will damage the 6146 tube.

On 80 meters, it may be required to shunt the RF output terminals with additional capacitance (from .0005 to .001 mmf) in order to obtain a good dip with low impedance loads.

6. Turn the ANTENNA LOADING control gradually until the plate current reaches 120 ma. Again adjust the PLATE TUNING control for a minimum current reading (dip). Repeat these two operations until the current reading is at either the NOVICE LIMIT calibration or 160 ma for full power input. These operations can be performed with two hands, one adjusting the PLATE TUNING and the other the ANTENNA LOADING. An increase in the plate current dip indicates antenna loading (power transfer to the load).

7. After the final amplifier is properly loaded, re-set the METER switch to GRID and again adjust the GRID TUNING control for a peak grid current reading. Then use the DRIVE control to set the grid current to the proper value for the type of operation. For CW operation, the proper maximum grid current is 2 ma. For operation with plate modulation, 2.5 to 3 ma maximum grid current is necessary.

## accessory connections

The octal socket on the rear chassis apron is mainly intended to provide 117 VAC line power to an antenna change-over relay (pins 2 & 7) applied at the TRANSMIT position of the FUNCTION switch only, and to permit connection of an external modulator (pins 4 & 6) such as the EICO Model 730. It also permits power take-off for accessory equipment as follows: 600 VDC at up to 15 ma between pins 3 and 8 (gnd); 6.3 VAC at up to 600 ma between pins 2 and 8 (gnd). In case of absence or failure

of AC power line, emergency power to operate the transmitter may be fed in through this socket as follows: 500-600 VDC at 170 ma between pins 3 and 8 (gnd) and 6.3 VDC at 3A between pins 2 and 8 (gnd). In all cases, pins 4 and 6 must be shorted together if a modulator is not connected to these pins, as otherwise the transmitter will not operate. An octal plug must always be inserted in this socket connected appropriately for the desired type of operation. See Figures 2 & 3 for details.

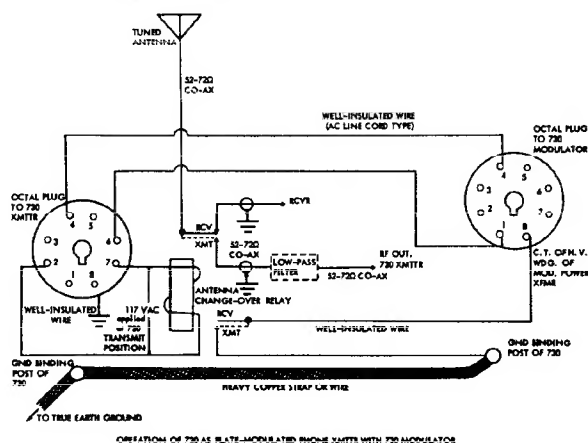


Fig. 2

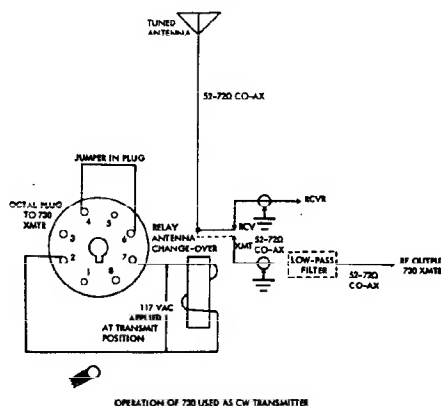


Fig. 3

## maintenance

### GENERAL

Your transmitter should require little service except for normal tube replacement. We recommend no substitutions for the tube types used. To facilitate servicing, remedial and trouble-shooting procedures have been provided in the TROUBLE-SHOOTING CHART that follows. A VOLTAGE CHART and a RESISTANCE CHART have also been provided as aids in locating defective components and to permit a careful, stage-by-stage check to the transmitter.

**WARNING:** If the transmitter is operated at any time without the cover or the bottom plate, the operator is exposed to lethal high voltage points and locations where severe RF burns can occur through bodily contact. If, for purpose of voltage checks, the transmitter must be operated with the cover and/or bottom plate removed, great care must be taken to avoid inadvertent bodily contact to dangerous points and all the general precautions for high voltage work must be observed. In any case, never leave the transmitter in an operative state with the cover and/or bottom plate removed, especially if children have access to it.

### ADJUSTMENT OF COIL L1.

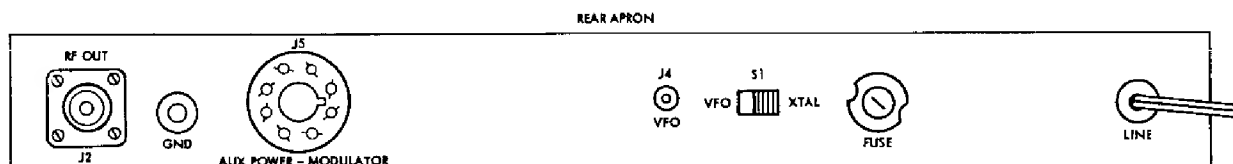
Insert the line cord into a 117 VAC receptacle and set the FUNCTION switch to STANDBY. Set the VFO-XTAL slide switch on the rear chassis apron to XTAL and insert a 40 meter crystal\* in the CRYSTAL socket on the front panel. Set the BAND SELECTOR to 20 meters, the DRIVE control to 50, and the FUNCTION switch to TUNE. Then set the METER switch to GRID and adjust the GRID TUNING control for a maximum reading on the meter. If the maximum exceeds 4 ma, use the DRIVE control to limit the maximum to 4 ma. Now turn the transmitter up on

one of the sides, and use a hex tuning wand, inserted through the 1/2" access hole in the bottom plate, to adjust the oscillator coil L1 slug for maximum grid current. Again, if the maximum current exceeds 4 ma, use the DRIVE control to limit the current to 4 ma. Re-set the FUNCTION switch to STANDBY and set the transmitter down in its normal position. The unit is now ready for operation and tune-up.

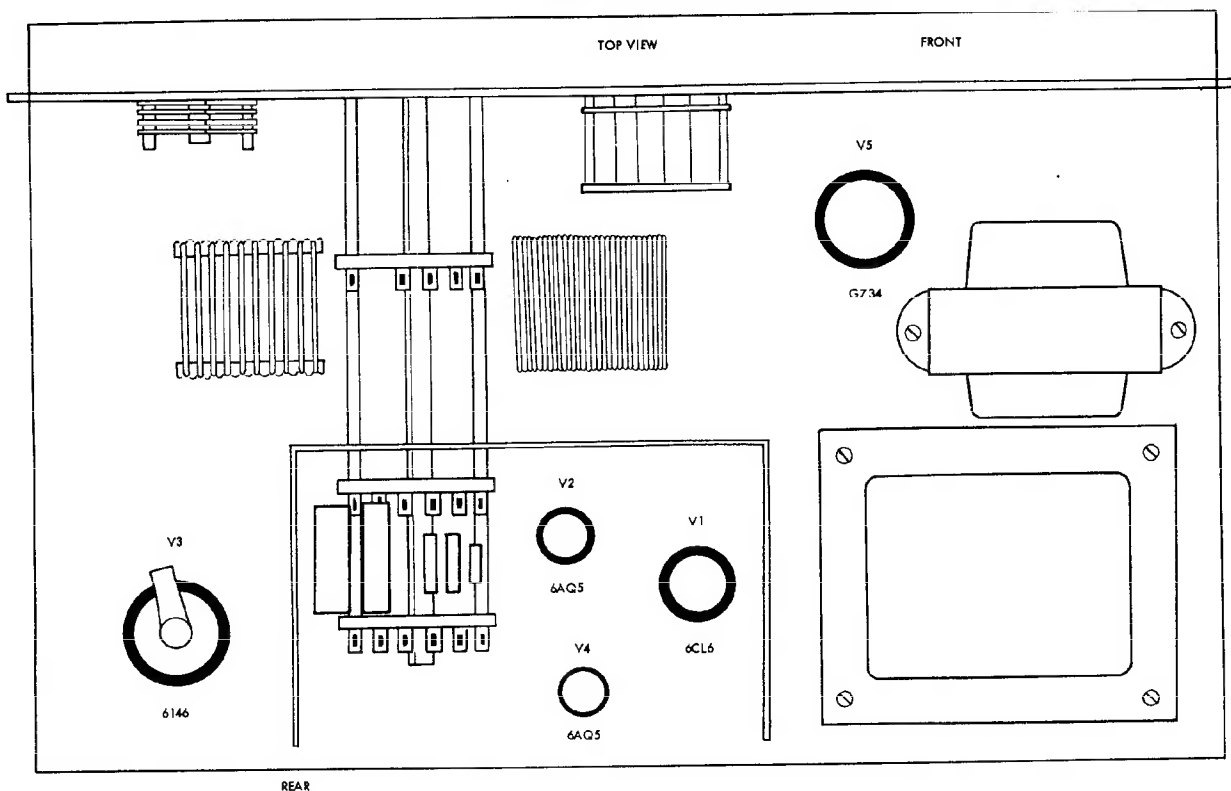
**\*NOTE:** For CW operation on all bands, it is desirable to perform the adjustment of L1 with a crystal between 7100 and 7200 kc for the coil L1 adjustment. For phony operation, use a crystal between 7200 and 7300 kc for the coil L1 adjustment.

### SERVICE

If trouble develops in your instrument which you cannot remedy yourself, write to our service department listing all possible indications that might be helpful. If desired, you may return the instrument to our factory where it will be placed in operating condition for \$12.50 plus the cost of parts replaced due to their being damaged in the course of construction. **NOTE:** Before returning this unit, be sure all parts are securely mounted. Attach a tag to the instrument, giving your home address and the trouble with the unit. Pack very carefully in a rugged container, using sufficient packing material (cotton, shredded newspaper, or excelsior), to make the unit completely immovable within the container. The original shipping carton is satisfactory, providing the original inserts are used or sufficient packing material is inserted to keep the instrument immovable. Ship by prepaid Railway Express, if possible, to Electronic Instrument Co., Inc., 33-00 Northern Blvd., Long Island City 1, N.Y. Return shipment will be made by express collect. Note that a carrier cannot be held liable for damages in transit if packing IN HIS OPINION, is insufficient.



## TUBE LAYOUT



## TROUBLE-SHOOTING CHART

SYMPTOM	CAUSE	SYMPTOM	CAUSE
House power line fuse blows. Fuse F1, remains intact.	Short in line cord. Shorted C29, 30, 31, or 32. L14 or L15 shorted to ground.	No drive, or absence of grid current.	Defective V1, V2, V3, V4 Key contacts not closed. No B+; open R2, R3, defective DRIVE pot. R7. C7, C10, C11, C13 shorted. Meter M1 open. METER switch S4 defective. Crystal defective. FUNCTION switch S3 defective. Coil L1 out of alignment, defective, shorted, or open. (Replace, or see coil L1 adjustment in this section).
Fuse F1, blows.	T1 pri., h.v. sec., filament windings shorted. Short in FUNCTION switch S3. Short in J5 (pins 2 & 7). Shorted V5 rectifier. C27, C28 excessively leaky or shorted. Shorted C35, 38, 43, 15. L16 shorted to ground.	Final amplifier not dipping properly. (Meter off scale).	No grid excitation. (No grid current - improper tuning).
Standby pilot I1 not lit. All filaments except V5 lit. STANDBY pilot & all filaments except V5 not lit.	Pilot lamp I1 blown.	Meter shunt R10 blown.	Overloaded antenna (short, etc.). Improper setting of BAND SELECTOR S2 for a given crystal. (e.g. 40 m crystal used for 80 m operation or vice versa).
Rectifier V5 filament not lit.	Open 6.3V filament winding.	Antenna will not load properly. (Low plate current after attempting to load antenna).	Defective ground system.
DC voltage at V5 cathode (pin 8) is incorrect as specified below.	Open 5V filament winding.	Heavy arcing at key contacts.	Wrong type of antenna. Shorted plates in ANT. LOADING capacitor C19. Shorted co-ax cable, etc.
(a) No voltage.	Defective V5. C27 or C28 shorted internally or externally. Connection to center tap of high voltage winding of T1 is open. Open choke L16.	No final amplifier plate current with grid current.	Defective V4. Open R11.
(b) Low voltage.	Low line voltage. One-half of h.v. sec. of T1 open. C5, 6, or 8 shorted. R16, 17 partially shorted.		Absence of shorting jumper between pins 4 and 6 of the octal plug inserted in octal socket J5 (when used as CW transmitter).
(c) High voltage.	High line voltage. R16, 17 open.		Open modulation transformer (in external modulator).
			RF choke L11 open. Open R12. FUNCTION switch S3 defective.

### VOLTAGE CHART

PIN NO.										
TUBE	1	2	3	4	5	6	7	8	9	
GZ34 V5	0	620 DC	0	720 AC	0	720 AC	0	620 DC		
6CL6 V1	RF —	RF —	150 DC	0	6.3 AC	RF	0	150 DC	RF	
6AQ5 V2	RF	9 DC	6.3 AC	0	RF	*90 DC	RF			
6AQ5 V4	-80 DC	0	0	6.3 AC	200 DC	150 DC	-80 DC			
6146 V3	0	0	200 DC	0	RF	0	6.3 AC	0		(CAP) RF
J5	6.3 AC	0	600 DC	600 DC	200 DC	600 DC	0	0		

\*Variable 0-150V

All voltages measured to ground with a 20,000 $\Omega$ /V VOM (not VTVM).  
Set to 20 meter operation with a 52 $\Omega$  dummy load or a 100 watt lamp  
connected to the RF output co-axial connector. Plate current set to  
150 ma and grid current to 3 ma.

### RESISTANCE CHART

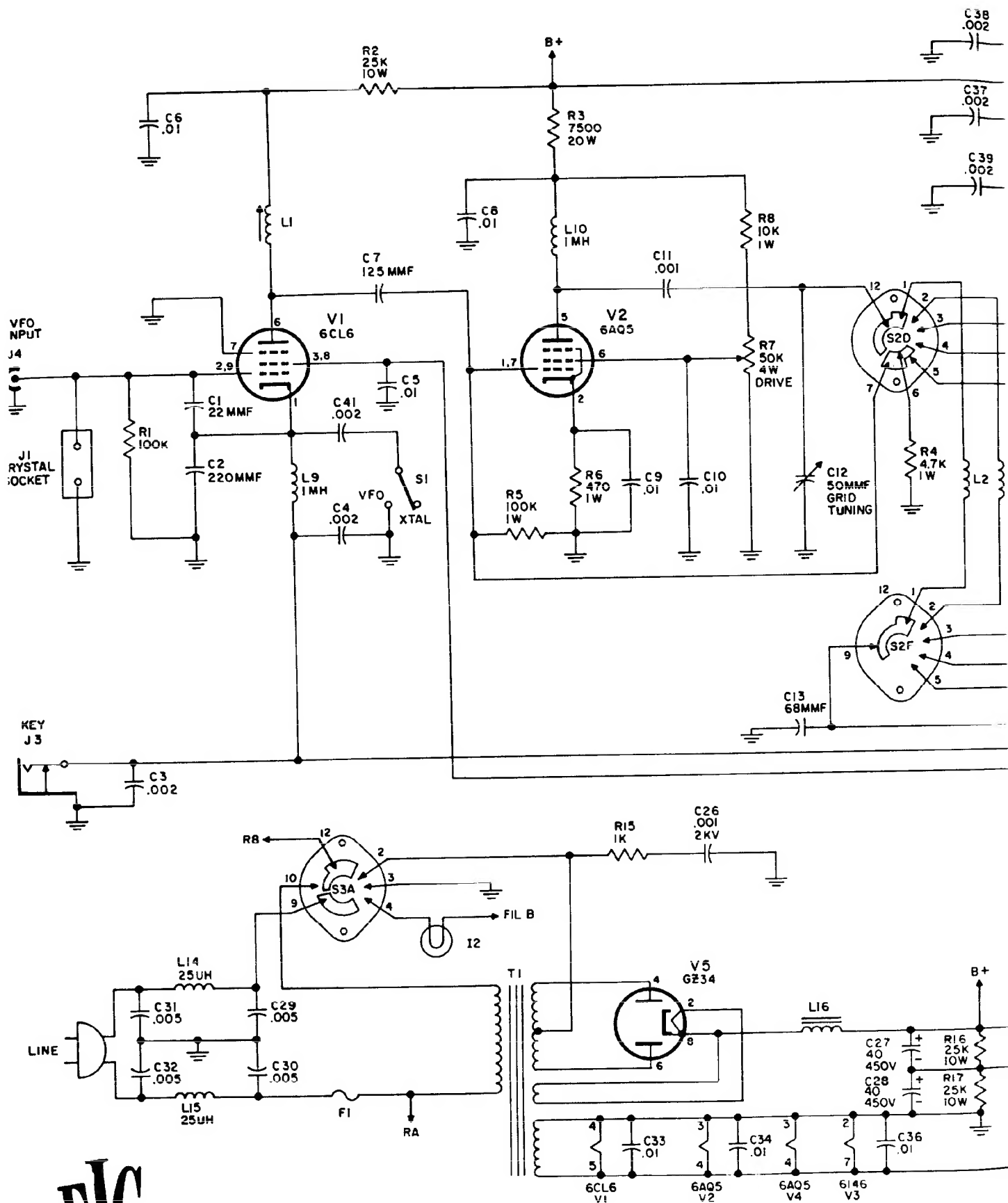
PIN NO.										
TUBE	1	2	3	4	5	6	7	8	9	
GZ34 V5	INF.	27K	INF.	INF.	INF.	INF.	INF.	27K		
6CL6 V1	35	100K	40K	0	—	52K	0	40K	100K	
6AQ5 V2	4.7K	470	—	0	28K	0	4.7K			
6AQ5 V4	27K	0	0	—	75K	73K	27K			
6146 V3	0	—	INF.	0	27K	0	—	0		(CAP) 27K
J5 Rear Octal	—	INF.	27K	27K	INF.	27K	INF.	0		

Transmitter line cord disconnected from AC power line, FUNCTION and  
METER switches set to OFF. DRIVE control set to zero. Dash (—) indi-  
cates "too low to read". INF. means infinite.

# REPLACEMENT PARTS LIST

Stock#	Symbol	Description	Am't.	Stock#	Symbol	Description	Am't.
22551	C1	cap., disc., 22mmf - 500V, ±10%	1	97701	X11, 2	pilot lite assembly	2
22552	C2	cap., disc., 220mmf - 500V, ±10%	1	97027	XV1	socket, top mount, 9 pin min.	1
22553	C3, 4, 22	cap., disc., .002mfd - 1000V, GMV (2K or 2000)	10	97040	XV2	socket, top mount, 7 pin	1
		23, 37, 38,		97041	XV3, 5	socket, octal	2
		39, 40, 41, 42		97022	XV4	socket, bottom mount, 7 pin	1
22554	C5, 6, 8, 9,	cap., disc., .01 mfd - 1000V, GMV (10K or 10,000)	13	40000		nut, hex, #6-32	28
		10, 17, 18,		40001		nut, hex, 3/8-32	7
		21, 25, 33,		40007		nut, hex, #4-40 x 1/4	14
		34, 35, 36		40008		nut, hex, #8-32	15
22545	C7	cap., disc., 125mmf - 1000V, ±10%	1	40016		nut, hex, 1/2-24 for fuseholder	1
22555	C11, 14, 24	cap., disc., .001mfd - 1000V, ±10%	3	40022		nut, hex, #4-40 x 3/16 for crystal socket	1
29009	C12	cap., variable, 50mmf	1	41000		screw, #6-32 x 1/4	21
22556	C13	cap., disc., 68mmf - 1000V, ±10%	1	41003		screw, #8-32 x 3/8	10
22557	C15, 26, 43	cap., disc., .001mfd - 2000V, ±20%	3	41004		screw, #6-32 x 2 1/2	1
29011	C16	cap., variable, 140mmf	1	41007		screw, #6-32 x 3/4	3
29010	C19	cap., variable, 2x420mmf	1	41009		screw, #4-40 x 3/4	1
22558	C20	cap., disc., 50mmf - 3000V, ±10%	1	41016		screw, #4-40 x 1/4	14
23021	C27, 28	cap., elec., 40mfd - 450V	2	41069		screw, set, #6-32 x 1/8	2
22528	C29-30,	cap., disc., 2x.005mfd	2	41059		screw, #6-32 x 1 1/8	3
	31-32			41071		screw, #8-32 x 2 1/4	2
91008	F1	fuse, 3A, slow blow	1	41072		screw, #8-32 x 3/4	4
92000	I1, 2	bulb, #47	2	41073		screw, #6 P.K. black	18
97500	J1	socket, crystal	1	42000		washer, lock, 3/8	7
50023	J2	jack, UHF	1	42001		washer, flat, 3/8	6
50022	J3	jack, phone, closed circuit	1	42002		washer, lock, #6	26
50014	J4	jack, RCA phono	1	42005		washer, flat, #6 metal	1
97041	J5	socket, octal	1	42006		washer, fibre shoulder #6	2
52001	J6	binding post	1	42007		washer, lock, #4	18
36014	L1	coil, slug tuned, 18uh	1	42008		washer, lock, #8	15
85027	L2	coil, fixed, 72uh, red dot	1	42025		washer, fibre shoulder #12	2
35028	L3	coil, fixed, 18uh, orange dot	1	42029		washer, rubber for fuseholder	1
35029	L4	coil, fixed, 4.3uh, green dot	1	43000		lug, #6	7
25030	L5	coil, fixed, 1.5uh	1	43001		lug, pot ground, 3/8	1
35031	L6	coil, fixed, .95uh	1	43004		lug, #8	5
35033	L7, 8	coil, fixed, air inductor	1	43006		lug, #4	3
35032	L8, 9	coil, fixed, air inductor	1	44016		standoff, metal 13/16	3
35034	L9, 10, 13	choke, RF, 1mh (3 windings)	3	45005		standoff, ceramic	4
35035	L11	choke, RF, 2.5mh (standoff)	1	46000		grommet, 3/8	1
35036	L12	choke, RF, 500uh	1	46001		grommet, 1/4	6
35020	L14, 15	choke, line, 25uh	2	46008		feet, rubber	4
34003	L16	choke, filter	1	50024		hood, UHF receptacle	1
35037	L17	choke, parasitic (coil on resistor)	1	51007		octal plug and hood	1
74006	M1	meter	1	53025		knob, round, 1 1/4" D	4
10410	R1	res., 100KΩ, 1/2W, ±10% (brown, black, yellow, silver)	1	53026		knob, round, 1 1/2" D	3
14303	R2, 16, 17	res., 25KΩ, 10W, ±10% (red, green, orange, silver)	3	57000		line cord	1
14350	R3	res., 7.5KΩ, 20W, ±10% (violet, green, red, silver)	1	58000		wire, hook-up	length
10816	R4	res., 4.7KΩ, 1W, ±20% (yellow, violet, red)	1	58300		spaghetti	length
10847	R5	res., 100KΩ, 1W, ±10% (brown, black, yellow, silver)	1	58402		cable, 300Ω twin lead	length
10861	R6	res., 470Ω, 1W, ±10% (yellow, violet, brown, silver)	1	58405		cable, RG58A/U	length
19017	R7	pot., 50KΩ, 4W, linear	1	58501		wire, bare #22 (thin)	length
10853	R8	res., 10KΩ, 1W, ±10% (brown, black, orange, silver)	1	58504		wire, bare #18 (heavy)	length
10832	R9	res., 27KΩ, 1W, ±10% (red, violet, orange, silver)	1	66072		manual of instruction (wired)	1
13004	R10	res., .512Ω, 1/2W, ±1%	1	66321		manual of instruction (kit)	1
10015	R11, 15	res., 1KΩ, 1/2W, ±20% (brown, black, red)	2	80065		panel	1
14304	R12	res., 50KΩ, 10W, ±10% (green, black, orange, silver)	1	81174		shield, meter	1
10850	R13	res., 33KΩ, 1W, ±10% (orange, orange, orange, silver)	1	81175		clamp, plastic cable	1
10851	R14	res., 22KΩ, 1W, ±10% (red, red, orange, silver)	1	81181		chassis, main	1
62001	S1	switch, slide, SPST	1	81182		bottom plate	1
60062	S2	switch, rotary, 3 sections	1	81183		shield, bottom	1
60063	S3	switch, rotary, 1 section	1	81184		shield, top	1
60064	S4	switch, rotary, 1 section	1	81185		cover, top shield	1
30026	T1	transformer, power	1	81186		hood	1
54015	TB1, 4	terminal strip, 3 post 2 left w/gnd	2	81903		cable clamp, metal	3
54004	TB2, 3	terminal strip, 2 post w/gnd	2	81908		clamp, for electrolytic capacitor	2
54000	TB5	terminal strip, 1 post left	1	82004		shaft, 1/4" OD	1
54001	TB6	terminal strip, 1 post right	1	83002		coupler fixed	1
54002	TB7	terminal strip, 1 post right w/gnd	1	85000		bushing, 3/8" OD	1
54019	TB8	terminal strip, 2 post right	1	85004		bushing, male ceramic	3
54007	TB9	terminal strip, 3 post, 2 right w/gnd	1	85005		bushing, female ceramic	3
54005	TB10	terminal strip, 2 post right w/gnd	1	97300		shield, tube, short	1
90056	V1	tube, 6CL6	1	97302		shield, tube, long	1
90047	V2, 4	tube, 6AQ5	2	97710		jewel, red	1
90055	V3	tube, 6146	1	97713		jewel, green	1
90044	V5	tube, 6Z34	1	98502		cap, tube	1
97800	XF1	fuseholder	1				





**E/C**

